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The influence of large-scale circulation patterns and boundary layer conditions on precipitation formation in Corsica

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The precipitation formation on Corsica in the western Mediterranean is highly affected by the interplay between large-scale weather patterns and the local-scale induced sea-slope breezes. Due to its geographical position the island experiences a strong seasonal cycle in the climatic conditions. From September to May, most of the precipitation is generated by large-scale weather systems, which cause frontal precipitation and in mountainous regions an orographically-induced enhancement. In contrast during the summer month the local combined sea slope breeze systems lead to rather convective precipitation events in the afternoon. The planetary boundary layer (PBL) is the surface affected atmosphere and follows in its structure and height the diurnal cycle. Its height gives information on the strength of turbulent mixing and thus, on the vertical moisture distribution.

In this study we investigate the moisture transport within and above the PBL along a west-east transect on Corsica in the period May 2017 to October 2019. PBL height was derived from wind field measurements with a 3D ultrasound anemometer at the western (Ajaccio) and eastern (Ghisonaccia) coastal sites and from sounding profiles at Ajaccio airport. In addition, the ERA5 reanalysis data along the west-east transect were used to derive the influence of the terrain on the depth of the mixed layer. In order to get further insight into the underlying processes and local mechanisms related to the PBL height development and moisture transport towards the mountains of Corsica the Weather Research and Forecasting (WRF) model is applied. Case studies of summertime convective precipitation formation related to large-scale weather types and local breezes also driven by the sea surface temperatures are presented. Finally, back-trajectory modeling is used to reflect atmospheric pathways and sources of precipitable water.